CLAIMS

What is claimed is:

1. A method for generating a reticle design, comprising:

generating a reticle pattern layout;

generating a reticle design from the pattern layout, wherein the reticle design includes at least one mixed feature including both a phase shift segment and a binary segment;

optimizing design features of the reticle design to generate an optimized reticle design, wherein the optimizing includes at least one of converting at least a portion of a phase shift design segment of a mixed design feature of the reticle design to a binary portion or converting at least a portion of a binary design segment of a mixed design feature of the reticle design to a phase shift portion.

2. The method of claim 1 further comprising:

building a reticle from the optimized reticle design.

3. The method of claim 1 wherein the converting includes using at least one of an over/under operation or an under/over operation.

4. The method of claim 3, wherein:

the converting includes using an over/under operation;

the over/under operation includes a first operation of expanding edges of phase shift segments of a design feature by a fixed amount, wherein for an expanded edge that contacts another expanded edge, the contacting expanded edges disappear; and

the over/under operation includes a second operation of retracting remaining expanded edges of the phase shift segments of the feature by the fixed amount.

5. The method of claim 4, wherein a binary segment located between two phase shift segments whose opposing sides disappear during the first operation is eliminated from the feature.

6. The method of claim 3, wherein:

the converting includes using an over/under operation;

the over/under operation includes a first operation of expanding edges of binary segments of a design feature by a fixed amount, wherein for an expanded edge that contacts another expanded edge, the contacting expanded edges disappear; and

the over/under operation includes a second operation of retracting remaining expanded edges of binary segments of the feature by the fixed amount.

7. The method of claim 6, wherein a phase shift segment located between two binary segments whose opposing sides disappear during the first operation is eliminated from the feature.

8. The method of claim 1 wherein the converting further includes converting a design feature edge portion from a binary design portion to a phase shift design portion.

9. The method of claim 8 wherein the design feature edge portion is located at an end of a feature.

10. The method of claim 1 wherein the converting further includes enlarging a corner binary segment.

11. The method of claim 10 wherein the corner binary segment is enlarged based upon an overlay tolerance of a reticle manufactoring tool.

12. The method of claim 1 wherein the generating a reticle design includes generating zebra design features.

13. The method of claim 12 wherein the converting includes converting one of a phase shift portion or binary portion of a zebra feature to the other of a phase shift portion or a binary portion.

14. The method of claim 12 wherein the generating zebra design features further include:

imposing spaced apart striped regions with designated mixed design features wherein portions of the designated mixed design features located in the striped regions are designated as one of phase shift segments or binary segments, and the portions of the designated mixed design features located outside of the striped regions are designated as the other of the phase shift segments or binary segments.

15. The method of claim 1 further comprising:

determining a mask error factor (MEF) of a design structure;

if the MEF of the design structure is positive, adjusting the size of the design structure to achieve an adjustment in size in a same direction of a wafer structure patterned as per the design structure;

if the MEF of the design structure is negative, performing one of adjusting the size of the design structure to achieve an adjustment in size in an opposite direction of the wafer structure or converting the design structure from a phase shift structure to a binary structure.

16. The method of claim 1 wherein the reticle design includes a feature with a portion oriented at non 90 degree angles with respect to other portions of the feature.

17. The method of claim 16 wherein the optimizing further includes performing one an over/under or under/over to remove a discontinuity in the feature with the portion oriented at a non 90 degree angle.

18. The method of claim 1 wherein the optimizing includes a below minimum width segment conversion operation.

19. The method of claim 1, further comprising binning features of a pattern layout as a function of a feature width in bins, wherein the bins include a phase shift feature bin, a binary feature bin, and a zebra feature bin.

20. The method of claim 19 wherein the generating a reticle design includes sizing features prior to the binning in order to reduce a number of features binned into zebra feature bins.

21. A method for generating a reticle design comprising:

generating a reticle design, the reticle design including mixed features that include a binary segment and a phase shift segment;

optimizing the reticle design to generate an optimized reticle design, wherein the optimizing includes at least one of performing an over/under operation, an under/over operation, a feature segment expansion operation, a feature edge portion conversion from a binary portion to a phase shift portion, a corner binary segment expansion, a discontinuity removal operation, a below minimum width segment conversion operation, or a feature dimension change operation that include a determination of a Mask Error Factor (MEF).

22. The method of claim 21 further comprising:

building a reticle from the optimized reticle design; and

exposing the reticle in a lithographic system to form photo-resist features on a wafer.